HSCC (INDIA) LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
AS CONSULTANT TO GOVERNMENT MEDICAL COLLEGE,
KOTA, RAJASTHAN

HSCC/SES/BSL-3/EPC/GMC-Kota/2024 Dated: 14.03.2024

AMENDMENT – I

Project Name: Planning, Detailed Design and Engineering, Construction, Testing, Commissioning & Validation of Bio Safety Level-3 laboratory at Govt. Medical College, Kota, Rajasthan including all infrastructure works in relation thereto such as Civil, Electrical, Mechanical, HVAC, Plumbing, Drainage, ETP, Furniture & Bio Safety Cabinets etc., Operation & Maintenance during one (01) year of Defect Liability Period and O&CMC for four (04) years after DLP on EPC Mode

Tender No. HSCC/SES/BSL-3/EPC/GMC-Kota/2024 Dated: 07.03.2024

This has reference to subject work, the following Amendment may be noted, which shall be treated as a part of the contract to be uploaded along with tender/ bid:

I. Reply to Pre-Bid Queries raised by bidders during pre -bid meeting held on 12.03.2024 at HSCC, Head Office, Noida

Sl. No.	Vol./ Cl. No. / Ref.	Bidder Queries / Request	HSCC Reply / Amended As
1.		Request for Amendment We request you to add FABTECH as an approved make for Modular Panels, Hot Shower, BIO SAFETY CABINETS, Ventilated Garment Cabinets, Dynamic Pass box.	Tender terms & conditions prevail.

2.		Request for amendment In addition, to work on the clarification after Prebid receiving it from your end, we would kindly request you to extend this tender by 1 weeks so that we can submit our optimum bid.	Tender terms & conditions prevail.
3.	Vol01-5, Similar Work	*Similar Work" shall mean Project comprising "Construction, Testing, Commissioning and Validation of Bio Safety Level-3/4 including Civil, HVAC, Electrical, PHE, Firefighting etc. works all executed under one composite agreement/work order. Request for amendment: The cGMP vaccine manufacturing units are equally or more critical. Requesting you to consider the same under similar works. Criteria of civil works inclusion under similar works may be removed.	Tender terms & conditions prevail.
4.	Vol01-4, Earnest Money Deposit	Rs. 14.76 Lakhs/- (Rupees Fourteen Lakhs Seventy Six Thousand Only), Request for amendment: We request you to allow EMD exemption for MSME/NSIC registered vendor.	Tender terms & conditions prevail.
5.	Vol01-4, Last date & time of submission of Online Tender	Up to 21.03.2024 by 15:00 hrs (IST) Request for amendment Requesting for kindly extend the submission date on - 28.03.2024	Tender terms & conditions prevail.

6.	Vol05-02, Quoting Sheet for the Bidder	Planning, Detailed Design and Engineering, Construction, Testing, Commissioning & Validation of Bio Safety Level-3 laboratory at Govt. Medical College, Kota, Rajasthan including all infrastructure works in relation thereto such as Civil, Electrical, Mechanical, HVAC, Plumbing, Drainage, ETP, Furniture & Bio Safety Cabinets etc., Operation and Maintenance during one (01) year of Defect Liability Period on EPC Mode Request for amendment Kindly confirm, O&CMC for 4 years after DLP is quoting with EPC mode or is extra as per Table-I.	Tender terms & conditions prevail.
7.	Vol04-531, APPROVED MAKE LIST FOR SPECIALISED EQUIPMENT	Bio-Safety Cabinet Request for amendment As and OEM, supplied to reputed organizations consider DYNA under approved make list.	Tender terms & conditions prevail.
8.	Vol04-531, APPROVED MAKE LIST FOR SPECIALISED EQUIPMENT	Dynamic Pass Box, Request for amendment As and OEM, supplied to reputed organizations consider DYNA under approved make list.	Tender terms & conditions prevail.
9.	Vol04-528, APPROVED MAKE LIST FOR SPECIALISED EQUIPMENT	AHU Request for amendment Requesting you to added Citizen under approved make list.	Tender terms & conditions prevail.

10.		Request for amendment Provide the soil test report of the site.	Soil investigation report of GMC-Kota premises is attached herewith for reference purpose only. However, the contractor shall at their own conduct topographical survey and geotechnical investigation, hydrological survey etc. from specialized agencies.
11.		Request for amendment For prepare an exact estimation in line with tender requirement and to make our best competitive offer we need more time and accordingly, you are requested to extend the due date of the bid submission by at least 15 days.	Tender terms & conditions prevail.
12.		It is given that "The Scope of work involves Design, Construction, Supply, Installation, Testing, Commissioning, Calibration, Certification, Demonstration, Training, Validation of Bio-safety level 3 (BSL-3) Laboratory & associated works on "Turnkey Basis" in compliance with D B T & 1 C M R / CDC, USA/WHO guidelines as minimum and its operation and maintenance during the defect liability period". Request for amendment Since there are some varying provisions given in these guidelines, kindly clarify the order of preference of guidelines to be followed for the subject works.	Tender terms & conditions prevail.

13.	Point no 3.1.2, SECTION - I DESCRIPTION AND SCOPE OF WORK:	Point no 3.1.2, SECTION - I DESCRIPTION AND SCOPE OF WORK: - GI Duct for Air distribution has been specified. Request for amendment As per DBT guidelines, the ducting in BSL-3 Laboratory should be in SS 304. Kindly clarify and confirm whether GI ducting or SS 304 Ducting is to be provided in BSL-3 Laboratory. Also, as per DBT Guidelines, the duct should be tested for any leakage at +1000 Pa pressure. Please clarify and confirm whether the BSL-3 Lab ducting shall require testing as per DBT guidelines or not?	As per DBT guidelines and guidelines mentioned in the tender document.
14.	Point no 7.12, SECTION - I DESCRIPTION AND SCOPE OF WORK:	Point no 7.12, SECTION - I DESCRIPTION AND SCOPE OF WORK: Flooring - It is specified that flooring shall be in epoxy or PVC (Poly Vinyl Chloride). Request for amendment Since the Epoxy flooring and PVC flooring are different types of flooring having different costs, kindly clarify which type of flooring should be considered for BSI-3 Lab and BSI-2 Lab.	As per guidelines mentioned in the tender document.
15.	Point no 17.4, SECTION - I DESCRIPTION AND SCOPE OF WORK	Request for amendment Point no 17.4, SECTION - I DESCRIPTION AND SCOPE OF WORK: - ETP - Both Kill Tank with Steam Boiler and Chemical Decontamination System has been specified in the tender. Since there is significant cost difference in Steam type Kill Tank with steam boiler and Chemical Type Chemical decontamination system, please clarify and confirm which type of ETP/BLED should be considered.	As per clause no. 17.4 of Technical Specifications.

16.		As per the given tender drawing, the ETP area/room is shown on ground floor. Request for amendment Please note that effluent from BSL-3 Laboratory should preferably be drained through gravity to the BLED/ETP Plant, which is not possible as per the given tender drawings. We therefore request you to kindly provide details/schematic of effluent management from BSL- 3 Laboratory to ETP/BLED plant.	As per guidelines mentioned in the tender document.
17.		Request for amendment As per DBT guidelines, the ETP/BLED should be considered as containment space. It is requested to please provide the construction details and layout plan of ETP/BLED room.	As per guidelines mentioned in the tender document.
18.		Request for amendment DESIGN BASIS REPORT BIOSAFETY LEVEL-3 LABORATORY: - It is specified that "Biosafety Doors with view panels must be self-closing and lockable". Whereas no Biosafety doors are indicated in the layout plan. Please provide the locations where Biosafety Doors are to be provided and also please provide the technical specifications of Biosafety Doors.	Tender terms & conditions prevail.
19.		Request for amendment DESIGN BASIS REPORT BIOSAFETY LEVEL-3 LABORATORY: At Point No. 4, items of Air Shower and Douse Shower are specified. These are not indicated in the tender drawings. Please provide the location and quantities of Air Shower and Douse Shower to be considered and provided.	Tender terms & conditions prevail.

20.		Request for amendment DESIGN BASIS REPORT BIOSAFETY LEVEL-3 LABORATORY: At Point No. 4 BIBO is specified in scope of work. Please clarify and confirm the following: - Whether BIBO Housing or HEPA Containment Housing is to be considered for BSL-3 Laboratory? - Whether any pressure leakage testing of HEPA Filter housing is required or not? If required, please confirm the test pressure.	As per guidelines mentioned in the tender document.
21.		Request for amendment DESIGN BASIS REPORT BIOSAFETY LEVEL-3 LABORATORY: The wall and ceiling of BSL-3 Laboratory is specified in "PUF sandwiched powder coated GI panel". The DBT Guidelines specifies leak testing of containment spaces initially at 125 Pa and finally at 250 Pa pressure. Please clarify and confirm whether leak testing of containment space as per DBT Guidelines is to be conducted or not?	As per DBT guidelines and guidelines mentioned in the tender document.
22.		Request for amendment Point no 18.2, SECTION - I DESCRIPTION AND SCOPE OF WORK: - Dunk Tank size mentioned in the tender is 550x5500x900mm. We understand the duck tank size should be 550x550x900 mm. Kindly clarify and confirm.	Tender terms & conditions prevail.
23.		Request for amendment Point no 18.4, SECTION - I DESCRIPTION AND SCOPE OF WORK: - Shower cubicle size mentioned in the tender is approximately 15 mtr. Dia. Please clarify and confirm the size of shower cubicle dia. to be provided.	Tender terms & conditions prevail.

24.		Request for amendment DBR of water supply distribution and water management system :- At point 2.4, It is specified that "Recycled water from proposed ETP and Existing Sewerage treatment plant shall be used for flushing/cooling tower makeup and irrigation" - Please provide details of existing sewerage system, as referred above. - Since the chillers specified are Air-Cooled type. Please clarify the cooling tower to be considered.	Bidder may visit the site at GMC-Kota before submitting their bid.
25.		Request for amendment Point no 21, SECTION - I DESCRIPTION AND SCOPE OF WORK: - TESTING, COMMISSIONING AND VALIDATION - It is specified that "The Validation shall be carried out in accordance with the ICMR, NIH Guidelines for commissioning and validation of BSL-3 Laboratories". Since the subject BSL-3 Laboratory is to be validated as per ICMR, NIH Guidelines, only these relevant guidelines should be allowed to be followed for construction of the subject BSL- 3 Laboratory. We therefore request you to: - Provide the validation procedure for BSL-3 laboratory as per ICMR, NIH Guidelines - Please clarify and confirm any requirement of BSL-3 Laboratory Certification from DBT?	Tender terms & conditions prevail.
26.		Request for amendment Point no 4.0 Page no 40 - MOBILIZATION ADVANCE - No provision of Mobilization Advance is given in the tender. To ensure smooth cash flow and speedy execution of the works, It is requested that the Advance Payment may be paid equivalent to 10% of the Contract Price	Tender terms & conditions prevail.

27.		Request for amendment Point No 13. Construction of BSL-3 Laboratory Building for GMC, Kota - All structural drawings & Facade drawings and Design Mix of Concrete etc. shall be got approved from HSCC Consultant and subsequently, IIT, Delhi/ Roorkee or approved by engineer-in-charge. We request to kindly consider Other IIT and NIT for structural drawings approvals.	Tender terms & conditions prevail.
28.		Request for amendment The DBT Guidelines specified 100% Standby UPS and DG Set with AMF Panel. Please clarify and confirm whether 100% standby UPS and DG set is to be considered or not?	Tender terms & conditions prevail.
29.		Please provide the finishing schedule of various areas/rooms for clarity and to enable the bidders quote for same/similar specifications.	Architecture DBR may please be referred.
30.		Please provide the building façade and elevation details for clarity and to enable the bidders quote for same/similar specifications.	Architecture DBR may please be referred.
31.		From the layout plan given in tender, we understand that the building construction in scope of work is from grid 1-4/A-G. The future construction area indicated in drawing is not in scope of construction works. Please clarify and confirm.	The future construction area indicated in drawing is not in scope of construction works of this tender. However, foundation in columns shall be designed considering the future provision.

32.		The Scope of work given in the tender specifies "Substation" Also, as specified in the tender, Supply and laying of the required power supply cable from the existing substation is included in the scope of work. Please clarify and confirm as under: - Whether new substation is included in the scope of work or not? - If power supply to BSI-3 is to be connected from existing substation, please provide the location and LT Panel details of existing substation and the cable route.	-New substation is not included in the scope of work. -Bidder may visit the site at GMC-Kota before submitting their bid.
33.		The Tender Drawing shows Roads around the building. Please clarify and confirm whether any road works and/or external development works are included in scope of works or not?	Tender terms & conditions prevail.
34.		The Scope of Works specifies STP. Please clarify and confirm whether the STP is included in the scope of works or not? If to be provided, please provide the location of STP.	Construction of STP is not in the scope of works of this tender.
35.		The Tender specifies that "Necessary arrangement of outlet pipeline connection of ETP shall also be made to the STP of the building/hospital". Please provide the location and piping route for piping connection to the STP.	ETP shall be connected to the nearest manhole leading to STP. Bidder may visit the site at GMC-Kota before submitting their bid.
36.		UVGI system is specified for Air Handling Units and Ducting to achieve 90% kill rate. UVGI system is not recommended either in AHU's or Ducting in any of the BSL-3 Lab Guidelines. We therefore request the following: - Please review the given requirement and omit the UVGI for AHU and Ducting of BSL-3. - If UVGI is to be provided, please provide the test procedure and protocols for testing the desired 90% kill rate.	As per guidelines mentioned in the tender document.
37.		Please clarify and confirm whether any Biosafety Consultant or 3rd party Vetting of BSI-3 designs and drawings is required or not?	Tender terms & conditions prevail.

II. As per the requirement and DBT guideline, the following points are incorporated the tender document and shall be treat as part of the tender document:

1. TESTING, COMMISSIONING AND VALIDATION OF FACILITY TO BE DONE BY CONTRACTOR

Validation of the BSL-3 facility should be conducted by ISO/IEC 17025/ Bureau of Indian Standards/ Quality Council of India certified agency, in liaison with the Laboratory In-charge and Biosafety Officer. The validation should essentially incorporate the following:

- Clean room validation
- Air Balancing test
- Room negative Pressure Test
- Particle Count Test (at REST)
- Temperature & Relative Humidity test
- Light level test
- Spore strip test

Validation and revalidation during CMC represent successful completion of commissioning and acceptance of operational protocols that meet the required design parameters, as per "**Regulations and Guidelines on Biosafety of Recombinant DNA Research & Biocontainment, 2017**". Performance based tests to be conducted at the time of validation. It is also a verification of all approvals from statutory bodies like Fire safety, Municipal corporation, Pollution control board, Electrical Inspector, Natural climatic safety and Boiler Inspection Authority, as applicable.

The validation process should also verify that following protocols have been developed in the facility:

- Staff training has been reinforced.
- SOPs for working in the facility have been developed.
- Mock drill has been conducted.
- A document describing the mandate and features of the laboratory has been developed.
- Facility and Operation Manuals explaining biosafety aspects as well as maintenance of engineering systems has been prepared.
- A Technical Manual should also be developed for the facility.

2. ONE YEAR DEFECT LIABILITY PERIOD AND CMC (2-5 YEAR) TO BE DONE BY CONTRACTOR

Revalidation of certain containment components should be performed in normal routine without affecting the working of containment facility. Nature and frequency depend on no. of factors. For example, following components can be revalidated without affecting the working of facility. These need to be revalidated, on annual basis:

- Revalidation of directional flow.
- Revalidation of No. of air changes etc.
- Detection of any visual leak in room perimeter.
- Leakage through entry/ exit doors, Pass box, Air-Lock doors etc.
- Re-calibration of sensitive controllers and gauges.
- Monitoring of the efficacy of autoclaves (quarterly internally)
- Monitoring the working of effluent decontamination system.
- Monitoring resistance across HEPA filters through pressure differential meters installed across HEPA filters will indicate the necessity &frequency of replacing HEPA filters.
- Biological safety cabinets need to be revalidated at least annually.
- Additionally, after relocation of the cabinet, after electrical or mechanical maintenance and after HEPA filters are replaced.
- Other containment equipment like IVC must be tested at least annually for HEPA filter integrity testing.
- Integrity testing of supply and exhaust HEPA filter housing and scanning of HEPA filters must be done annually. HEPA filters must be decontaminated prior to testing.
- Liquid effluent decontamination system and BAS must be tested annually.
- Revalidation of critical components like integrity of room perimeter & duct work is necessary every time any major structural repair or modification in the structure or new installation of any critical equipment has been done.

All the testing and revalidation must be done annually by qualified, competent, ISO/IEC 17025/ Bureau of Indian Standards/Quality Council of India certified third party organization.

III. The validity of Bid Security/ Earnest Money Deposit (EMD) to be submitted by the bidders with their bid in the form of Bank Guarantee (BG) shall be considered from the original due date of bid submission i.e., from 21.03.2024 and valid upto 17.09.2024.

All other terms & Conditions of the Tender shall remain unchanged.

Prospective bidders are advised to regularly visit through HSCC e-tender portal https://hscc.enivida.com, HSCC website http://www.hsccltd.co.in & CPP Portal https://eprocure.gov.in/epublish/app as corrigendum/amendments etc., if any, will be notified on this portal only and not be published anywhere else.

(- Sd -)
General Manager,
HSCC (India) Ltd.

PNT

A

REPORT ON

GEOTECHNICAL INVESTIGATION FOR PROPOSED CONSTRUCTION OF SUPER SPECIALTY HOSPITAL BLOCK FOR UP-GRADATION OF GOVT. MEDICAL COLLEGE/INSTITUTE UNDER PMSSY-III, KOTA

For :

CHIEF GENERAL MANAGER

HSCC (INDIA) LIMITED,

NOIDA (UP)

By :

PNT DESIGNS PVT LTD.

A-229 (A), Road No.5, I.P.I.A., Jhalawar Road

KOTA-324005 (Raj.)

Mob.09929866699, 9414188818

CONTENTS

1.0 INTRODUCTION

It is proposed to carryout Geotechnical Investigation for proposed construction of Super Specialty Hospital Block for Up gradation of Government Medical College /Institutes under PMSSY-III, Kota. The site plan is shown in Fig.1.

The Schedule of work and the locations of bore holes were decided by Engineer Incharge. The details are given in the following sections.

2.0 SCOPE OF WORK

Soil investigation was planned for

i) Boring in soil by shell and auger method as per IS 1892 : 1979 upto 6.0 m depth and conducting Standard Penetration Test (SPT) in bore holes as per IS 2131-1981, upto 6.0 m depth or refusal whichever is earlier. Boring beyond refusal strata in rocky strata / gravels / boulders upto 6.0m and collection of rock samples, determination core recovery, RQD and properties of rock. 3 Nos.

ii) Collecting soil / rock samples and conducting laboratory tests.

iii) Transportation of plants and personnel to the site

iv) Recommendation of safe bearing capacity and submission of report.

Accordingly, three bore holes were performed at the proposed locations. Soil/ rocks samples were collected for further testing in the laboratory.

3.0 FIELD INVESTIGATION

3.1 Boring

Three bore holes (i.e. BH-1 to BH-3) were made at the location as shown in Fig.1. Drilling was made by power driven rig upto the depth of 6.00m. The rock samples were collected as required for laboratory testing.

3.2 Water Table

The water table was not observed upto the depth of exploration i.e., 6.00m at time of investigation (i.e. Sept'2015).

4.0 LABORATORY INVESTIGATION

A. Rock

a) Uniaxial Compressive strength

b) Water absorption

c) Specific gravity

d) Density

The laboratory tests were conducted on the rock samples obtained from test bore holes and results are presented in Table-1 to 3.

5.0 INTERPRETATION OF TEST RESULTS

5.1 Type of Strata

Based on laboratory and field investigation the strata at the site have been described.

BH-1 : The strata at the site was found to be Fine Grained Hard Rock upto

the depth of exploration i.e. 6.00m. The bore-log of the strata is presented in Table-1.

BH-2 : The upper layer of strata upto the depth of 0.30m consists of Gravels / Boulders. Below this, the strata was found to be Fine Grained Hard Rock upto the depth of exploration i.e. 6.00m. The bore-log of the strata is presented in Table-2.

BH-3 : The strata at the site was found to be Fine Grained Hard Rock upto the depth of exploration i.e. 6.00m. The bore-log of the strata is presented in Table-3.

6.0 CRITERIA FOR COMPUTATION OF ALLOWABLE SOIL PRESSURE

For a satisfactory performance of the foundation, following criteria must be satisfied :

(i) The foundation must be safe against shear failure.

(ii) The foundation must not undergo excessive settlement.

The smaller of the bearing pressures obtained according to (i) and (ii) above is adopted as the allowable bearing pressure.

A permissible total settlement of 12 mm for a foundation resting on rock is specified IS:13036-1991.

6.1 For the Structures Resting on Rocky Strata

The bearing pressure of rocky strata is determined by various methods suggested as per IS: 12070-1987. The methods are described as below:

6.1.1 Based on Rock Classification:

The net safe bearing pressure based on classification of the rock is tabulated below as per IS: 12070-1987.

TABLE-A :NET SAFE BEARING PRESSURE (qns) BASED ON CLASSIFICATION

Material	qns (t/m^2)
Massive Crystalline bedrock including granite, diorite, gneiss, trap rock	1000
Foliated rocks such as schist or slate in sound condition	400
Bedded limestone in sound condition	400
Sedimentary rock, including hard shales and sandstones	250
Soft or broken bedrock (excluding shale), and soft limestone	100
Soft shale	40

6.1.2 Rock Mass Rating (RMR) – may also be used to give net allowable pressure as per Table-B. This will ensure settlement of raft foundation up to 6 m thickness to be less than 12mm.

TABLE B NET SAFE BEARING PRESSURE BASED ON RMR					
CLASSIFICATION NO.	**I**	**II**	**III**	**IV**	**V**
Description of rock	Very Good	Good	Fair	Poor	Very Poor
R M R	100-81	80-61	60-41	40-21	20-0
Qns (t/m^2)	600-448	440-288	280-151	145-90-58	55-45-40

6.1.3 Based on Core Strength of the Rock

Where the rock is sound the strength of the foundation rock is generally much in excess of the design requirements, provided the wall of the discontinuities is closed and they are favorably oriented with respect to the applied forces.

In case of rock mass with favorable characteristics that is, rock surface is parallel to the base of the foundation, the load has no tangential component, the rock mass has no open discontinuities, the safe bearing pressure should be estimated from the equation:

$$q_s = q_c N_i$$

Where

q_s = safe bearing pressure (gross),

q_c = average uniaxial compressive strength of rock cores,

N_i = empirical coefficient depending on the spacing of discontinuities

$$= \frac{3 + S/B_f}{10\sqrt{1 + 300\,\delta / S}}$$

δ = thickness of discontinuities in cm,

S = spacing of discontinuities in cm, and

B_f = footing width in cm

6.1.4 Correction to the Net Safe Bearing Pressure

For getting the allowable bearing pressure the safe bearing pressure obtained from the Table-A of IS: 12070-1987 and based on unconfined compressive strength, should be multiplied with the correction factor(s) given below according to the geological conditions. These corrections are not applicable for the classification of RMR method given in Table-B (of IS: 12070-1987)

Allowances should be made for submerged conditions, cavities and slopes as given below:

i)	Submerged condition under water table	
a)	Rock with discontinuous joints with opening less than 1mm wide;	¾
b)	Rock with continuous joints with opening 1 to 5 mm wide and filled with clay; and	¾ to ½
c)	Limestone / Dolomite deposit with major cavities filled with soil	⅔ to ½
ii)	Cavities	
	Major cavities inside limestone (core recovery less than 70 percent)	½
iii)	Slope	
a)	Fair orientation of continuous joints in the slope	1 to ½
b)	Unfavorable orientation of continuous joints in slope	½ to 1/3

Note: Factor of safety of slope should be at least 1.20.

7.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

The allowable bearing capacity has been calculated depending upon the strata available at the site. The allowable bearing pressure depending upon compressive strength of the rock, as per IS: 12070:1987. The detail of the calculation of bearing pressure are shown in Appendix-A.

The minimum depth of foundation and allowable bearing capacity at each borehole are given below :

Borehole No./Location	Min. depth of foundation	Allowable Bearing Capacity
BH-1 to BH-3	0.60m	50.0 t/m²

However, it is to ensure that foundation should rest on rocky strata.

8.0 CONCLUSIONS AND RECOMMENDATIONS :

Based on limited field exploration and laboratory investigation of rock, the following are the conclusions and recommendations:

1. The proposed site for proposed construction of Super Specialty Hospital Block for Up gradation of Government Medical College /Institutes under PMSSY-III, Kota. The site plan is shown in Fig.1.
2. **BH-1 :** The strata at the site was found to be Fine Grained Hard Rock upto the depth of exploration i.e. 6.00m. The bore-log of the strata is presented in Table-1.

   BH-2 : The upper layer of strata upto the depth of 0.30m consists of Gravels / Boulders. Below this, the strata was found to be Fine Grained Hard Rock upto the depth of exploration i.e. 6.00m. The bore-log of the strata is presented in Table-2.

   BH-3 : The strata at the site was found to be Fine Grained Hard Rock upto the depth of exploration i.e. 6.00m. The bore-log of the strata is presented in Table-3.
3. The water table was not observed upto the depth of exploration i.e., 6.00m at time of investigation (i.e. Sept'2015).

4. The minimum depth of foundation and allowable bearing capacity at each borehole are give below :

Borehole No./Location	Min. depth of foundation	Allowable Bearing Capacity
BH-1 to BH-3	0.60m	50.0 t/m²

5. It is to ensure that foundation should rest on rocky strata.

All the above recommendations are based upon the field data collected from limited test locations and results of laboratory tests carried out on soil samples recovered from test bore holes and our experience in this regard. In case the proposed structure is located away from the test locations and /or the actual subsoil conditions during excavation of foundation trench are found different from what has been reported above, the consultants are to be referred for suggestions prior to taking up of actual construction work at site.

ACKNOWLEDGEMENTS

We express our sincere thanks to **Mr. S.A Usmani, Chief General Manager**, HSCC (INDIA) LIMITED for sponsoring the project.

FOR PNT DESIGNS PVT. LTD

DIRECTOR

REFERENCES

1.	IS: 1904-1978	Code of practice for design and construction of foundation on soil- General Requirement.
2.	IS: 6403-1981	Code of practice for determination of bearing capacity of shallow foundations.
3.	IS: 8009 Part I 1976	Code of practice for calculation of settlement of foundations.
4.	IS: 1498-1970	Classification & Identification of soil for general engineering purpose.
5.	IS: 2131-1981	Method of standard penetration test for soil
6.	IS: 4968 Part I 1976	Method of subsurface soundings of soils
7.	Ranjan & Rao (1992)	Basic and Applied Soil Mechanics : Wiley Eastern Limited, Delhi
8.	IS:13063:1991	Structural safety of building on shallow foundations on rocks- code of Practice
9.	IS:12070-1987	Code of practice for design and construction of shallow foundation on rocks
10.	IS:9143-1979	Method for the determination of unconfined compressive strength of rock materials
11.	11315 Part-11 1985	Methods for the quantitative description of discontinuities in rock mass - Core recovery and rock quality designation.
12.	IS:2720	Methods of determination of Engineering Properties of soil.

Appendix-A

BEARING PRESSURE OF FOUNDATION FOR CONSTRUCTION OF SUPER SPECIALTY BLOCK FOR UP GRADATION OF GOVT. MEDICAL COLLEGES / INSTITUTES UNDER PMSSY-III, KOTA

(BASED ON UNIAXIAL COMPRESSIVE STRENGTH OF ROCK)

Location : BH-1, BH-2 & BH-3
Depth : 0.60m

The safe bearing pressure of rocky strata for shallow foundation has been worked out on the basis of uniaxial compressive strength of the rock. The following equation for safe bearing pressure has been used as per IS 12070-1987.

$q_s = q_c N_j$ ..... (1)

Where q_s = safe bearing pressure
q_c = average uniaxial compressive strength of rock core
N_j = empirical co-efficient
= 0.1 (IS:12070-1987)

The safe bearing pressure so obtained from eq.1 should be applied with the corrections as per IS:12070-1987. The code recommends that following multi plying correction factors are to be applied to get allowable bearing pressure: a). Submergence correction (1/2). b) Orientation of joint correction (1/2).

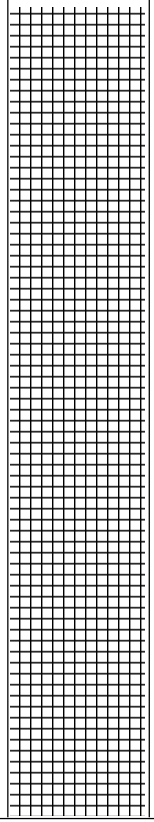
Looking into the possibilities of temporary submergence during rainy season and orientation of joints above mentioned multiplying correction factors have been used.

Depth of Foundation (m)	=	0.60 m
Uniaxial strength, qc (t/m²)	=	2232 t/m²
Safe bearing pressure, qs (t/m²)	=	2232 x0.1t/m²
Safe bearing pressure, qs (t/m²) (from Eq.1)	=	223.2 t/m²
Submergence Correction	=	1/2
Orientation of Joint Correction	=	1/2
Allowable bearing pressure (t/m²) (after applying corrections)	=	55.80 t/m²
The Recommended Net allowable Bearing pressure at the depth of 0.6m	=	***50.0 t/m²***

TABLE-1 : RESULT SHEET FOR BH-1

PROJECT : GEOTECHNICAL INVESTIGATION FOR CONSTRUCTION OF SUPER SPECIALTY HOSPITAL BLOCK FOR UP GRADATION OF GOVERNMENT MEDICAL COLLEGE /INSTITUTES UNDER PMSSY-III, KOTA

Size of Hole : Nx Size Type of Bit : TC diamand Period : SEPT.'2015

Depth (m)	N-Values	Bore Log	Description of Strata	Core Recovery (%)	RQD (%)	q_u (t/m^2)	Density (t/m^3)	Return Water		Specific Gravity	Water Absorption (%)
								Color	Loss (%)		
1.0			FINE GRAINED HARD ROCK	90.0	42.7	2677	2.65	Brownish	30	-	-
2.0				85.3	43.3	-	-	Brownish	50	-	-
3.0				95.0	79.0	3349	2.61	Brownish	100	-	-
4.0				98.0	52.0	-	-	Brownish	-	-	-
5.0				93.0	89.0	5684	2.62	Brownish	-	-	-
6.0											

R = Refusal to SPT (N> 50), RQD = Rock Quality Designation, q_u =Unixial Compressive Strength ▽ = Water Table

ISO 9001:2008 Quality Certified Lab.

PNT

Digitally signed by A
KUMAR JAIN
Date: 2024.03.14 2

TABLE-2 : RESULT SHEET FOR BH-2

PROJECT : GEOTECHNICAL INVESTIGATION FOR CONSTRUCTION OF SUPER SPECIALTY HOSPITAL BLOCK FOR UP GRADATION OF GOVERNMENT MEDICAL COLLEGE /INSTITUTES UNDER PMSSY-III, KOTA

Size of Hole : Nx Size Type of Bit : TC diamand Period : SEPT.'2015

Depth (m)	N-Values	Bore Log	Description of Strata	Core Recovery (%)	RQD (%)	q_u (t/m^2)	Density (t/m^3)	Return Water		Specific Gravity	Water Absorption (%)
								Color	Loss (%)		
0.3			GRAVELS/ BOULDERS								
1.0			FINE GRAINED HARD ROCK	87.5	10.8	2232	2.65	Brownish	50	-	-
2.0				92.7	60.0	-	-	Brownish	90	-	-
3.0											
4.0				89.3	82.7	2507	2.63	Brownish	100	-	-
5.0				86.7	18.0	2226	2.61	Brownish	100	-	-
6.0											

R = Refusal to SPT (N> 50), RQD = Rock Quality Designation, q_u =Unixial Compressive Strength ▽ = Water Table

ISO 9001:2008 Quality Certified Lab.

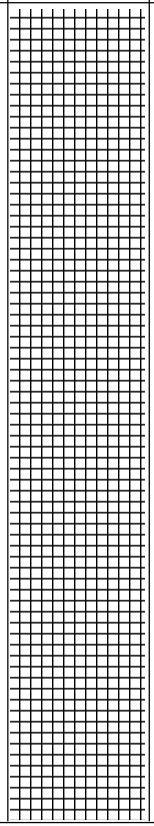
PNT

Digitally signed by A
KUMAR JAIN
Date: 2024.03.14 2

TABLE-3 : RESULT SHEET FOR BH-3

PROJECT : GEOTECHNICAL INVESTIGATION FOR CONSTRUCTION OF SUPER SPECIALTY HOSPITAL BLOCK FOR UP GRADATION OF GOVERNMENT MEDICAL COLLEGE /INSTITUTES UNDER PMSSY-III, KOTA

Size of Hole : Nx Size Type of Bit : TC diamand Period : SEPT.'2015

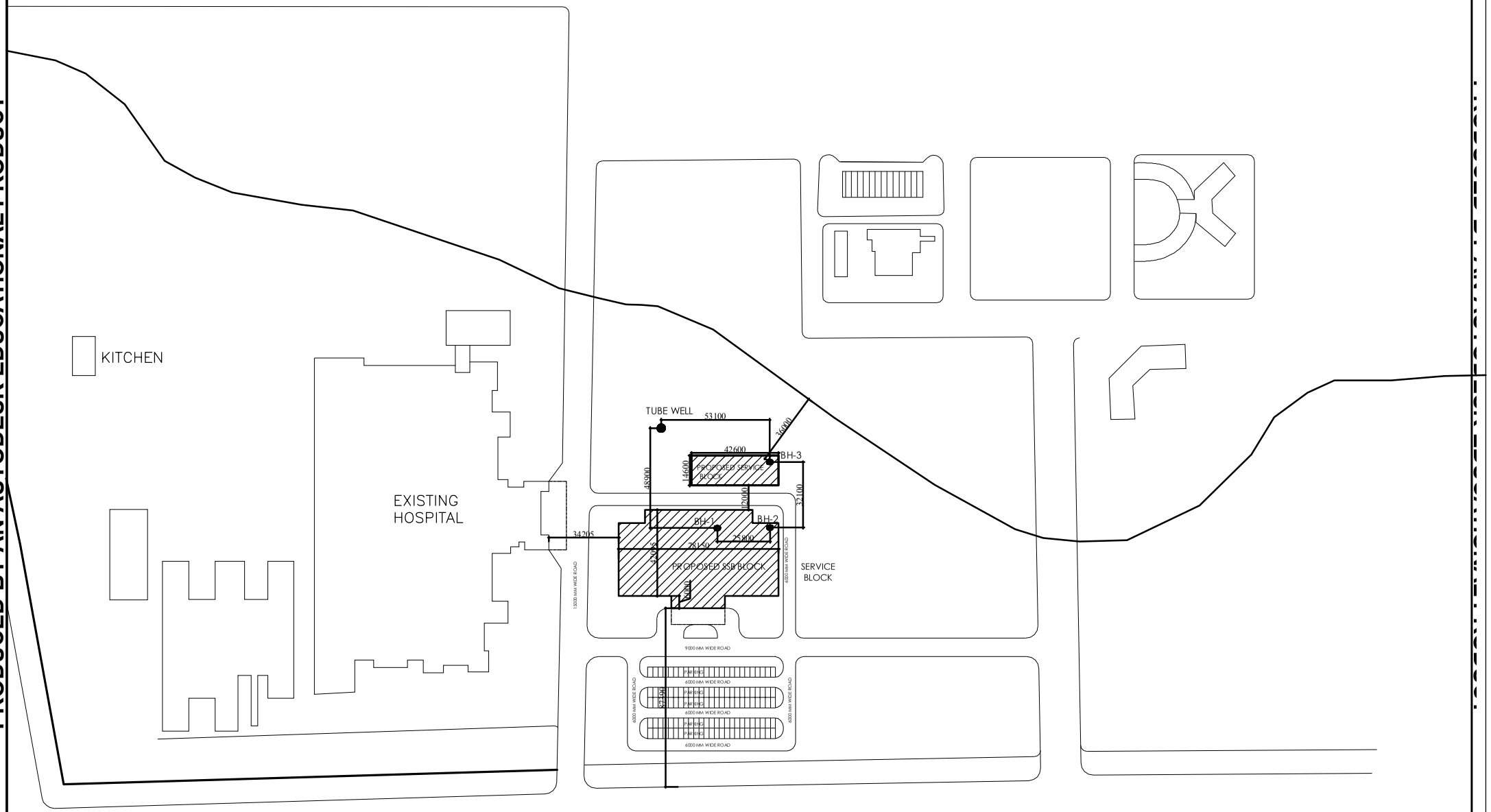
Depth (m)	N-Values	Bore Log	Description of Strata	Core Recovery (%)	RQD (%)	q_u (t/m^2)	Density (t/m^3)	Return Water		Specific Gravity	Water Absorption (%)
								Color	Loss (%)		
1.0			FINE GRAINED HARD ROCK	93.3	48.7	3236	2.64	Brownish	25	-	-
2.0				94.0	56.0	-	-	Brownish	50	-	-
3.0				93.3	87.3	6133	2.58	-	100	-	-
4.0				91.0	91.0	3787	2.59	Brownish	100	-	-
5.0				92.0	88.0	-	-	-	100	-	-
6.0											

R = Refusal to SPT (N> 50), RQD = Rock Quality Designation, q_u =Unixial Compressive Strength ▽ = Water Table

ISO 9001:2008 Quality Certified Lab.

PNT

Digitally signed by A
KUMAR JAIN
Date: 2024.03.14 2



SITE PLAN

GROUND FLOOR COVERED AREA = 2800 SQ.MT.
TOTAL BUILDING COVERED AREA = 17900 SQ.MT.
SERVICE BLOCK AREA = 809 SQ.MT.

● LOCATION OF BOREHOLE

FIG.1
SITE PLAN SHOWING LOCATION OF BOREHOLE FOR CONSTRUCTION OF SUPER SPECIALTY HOSPITAL BLOCK FOR UPGRADATION OF GOVERNMENT MEDICAL COLLEGE/ INSTITUTES UNDER PMLGS-III, KOTA

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT